

Supplementary Appendix

This appendix has been provided by the authors to give readers additional information about their work.

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Supplementary Appendix

Life Expectancy after Bariatric Surgery in the Swedish Obese Subjects Study

by

Carlsson LMS. et al.

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SOS study design

As a result of recruitment campaigns in the mass media and at primary health-care centers, 6905 persons completed a matching examination and 5335 of them were eligible for inclusion in the SOS study. 2010 individuals electing surgery constituted the surgery group and a contemporaneously matched control group (n=2,037) was created based on 18 matching variables. The 18 variables were sex, postmenopausal status, age, smoking status, diabetes, weight, height, hip circumference, waist circumference, systolic blood pressure, triglycerides, total cholesterol, current health, monotony avoidance, psychasthenia, quantity of social support, quality of social support and stressful life events. The matching was not performed at an individual level. Instead the matching algorithm selected controls so that the current mean values of the 18 matching variables in the control group became as similar as possible to the current mean values in the surgery group according to the method of sequential treatment assignment (Pocock SJ, Simon R. Sequential treatment assignment with balancing for prognostic factors in the controlled clinical trial. *Biometrics* 1975; 31(1): 103-15).

Participants included in the surgery group were put on a waiting list for bariatric surgery, and the average waiting time was 13 months. The intervention began on the day of surgery for patients in the surgery group and for their matched controls, and the baseline examination was performed approximately four weeks before that. During the time between the matching examination and the baseline examination, changes in the matching variables occurred, resulting in a surgery group that was slightly heavier and showed a slightly less favorable metabolic profile compared to the control group (Sjöström L. Review of the key results from the Swedish Obese Subjects (SOS) trial - a prospective controlled intervention study of bariatric surgery. *J Intern Med* 2013;273:219-34).

During follow-up, physical examinations were undertaken after 0.5, 1, 2, 3, 4, 6, 8, 10, 15 and 20 years. Fasting blood samples obtained at baseline and after 2, 10, 15 and 20 years were analyzed at the Central Laboratory, Sahlgrenska University Hospital, Gothenburg, Sweden, accredited according to International Organization for Standardization/International Electrochemical Commission 15189:2007 standards.

Table S1. Diagnostics for parametric proportional hazard models based on Weibull, generalized gamma and Gompertz distributions.

Model	Log pseudolikelihood	Degrees of freedom	Akaike's information criterion
Gompertz proportional hazard model:			
Unadjusted	-2883.3	4	5774.6
Adjusted	-2477.4	22	4998.7
Weibull proportional hazard model:			
Unadjusted	-2925.1	4	5858.2
Adjusted	-2527.3	22	5098.6
Generalized proportional hazard model:			
Unadjusted	-2910.1	5	5830.2
Adjusted	-2520.9	23	5087.7

Table S2. Mortality rates, hazard ratios and differences in median life expectancy from Gompertz proportional hazard regression model based on as assigned treatment.

	SOS study		SOS reference cohort
	Control	Surgery	
Number of deaths/N Person-years	571/2037 44,283	489/2010 44,669	125/1135 24,112
Mortality rate/1000 person-years (95% CI)	12.9 (11.9-14.0)	10.9 (10.0-12.0)	5.2 (4.4-6.2)
Hazard ratio (95% CI) P-value:	- (reference)	0.83 (0.73-0.93) 0.002	0.46 (0.38-0.56) <0.001
Adjusted hazard ratio (95% CI) P-value:	- (reference)	0.73 (0.64-0.84) <0.001	0.39 (0.31-0.48) <0.001
Difference in median life expectancy, years (95% CI) P-value:	- (reference)	1.7 (0.6-2.8) 0.002	7.0 (5.0-9.0) <0.001
Adjusted difference in median life expectancy, years (95% CI) P-value:	- (reference)	2.6 (1.5-3.8) <0.001	8.3 (6.3-10.4) <0.001

Table S3. Causes of death in the SOS control and surgery groups.
Unadjusted sub-hazard ratios (sHR) with 95% confidence intervals (CI)
from Fine and Gray competing risk regression models.

	Surgery	Control	sHR	95% CI	
CARDIOVASCULAR CONDITION	167	221	0.70	0.57	0.85
Cardiac	146	183	0.74	0.60	0.92
Myocardial infarction	31	58	0.51	0.33	0.79
Heart failure	23	41	0.52	0.31	0.88
Sudden death	89	80	1.05	0.77	1.42
Other	3	4	0.70	0.16	3.08
Stroke (except subarachnoid bleeding)	15	31	0.45	0.24	0.84
Intracerebral hemorrhage	9	10	0.85	0.35	2.09
Infarction	3	12	0.23	0.07	0.83
Other or unspecified	3	9	0.31	0.09	1.15
Subarachnoid bleeding	4	0			
Other	2	7	0.28	0.06	1.35
Aortic aneurysm	1	6			
Aortic thrombosis	0	1			
Other large artery damage	1	0			
Other or multiple cardiovascular disease	0	0			
NONCARDIOVASCULAR CONDITION	273	298	0.86	0.73	1.01
Neoplasm	135	166	0.76	0.61	0.96
Malignant	135	165	0.77	0.61	0.96
Benign	0	1			
Complication after bariatric surgery	7	0			
Complication after other surgery	10	5	1.86	0.64	5.43
Infection	33	48	0.64	0.41	1.00
Neurological disease	14	12	1.09	0.51	2.36
Kidney disease	8	9	0.83	0.32	2.16
Liver disease	7	5	1.29	0.41	4.08

Gastrointestinal disease	3	3	0.93	0.19	4.58
Lung disease	9	14	0.60	0.26	1.40
Thromboembolic disease	8	15	0.51	0.22	1.20
Pulmonary embolism	7	15	0.45	0.18	1.09
Vena caval thrombosis	1	0			
OTHER OR MULTIPLE CONDITIONS	14	12	1.10	0.51	2.38
CAUSES OTHER THAN DISEASE	38	20	1.85	1.08	3.17
Alcohol abuse	16	9	1.73	0.77	3.91
Trauma / Accident	11	8	1.31	0.53	3.26
Suicide	11	3	3.60	1.01	12.81
UNKNOWN	4	9	0.41	0.13	1.33
TOTAL	457	539	0.77	0.68	0.87

Table S4. Causes of death in the SOS surgery group and the SOS Reference cohort. Unadjusted sub-hazard ratios (sHR) with 95% confidence intervals (CI) from Fine and Gray competing risk regression models.

	SOS Surgery	SOS Reference	sHR	95% CI	
CARDIOVASCULAR CONDITION	167	30	2.64	1.78	3.91
Cardiac	146	21	3.26	2.06	5.17
Myocardial infarction	31	6	2.70	1.12	6.46
Heart failure	23	1			
Sudden death	89	12	3.45	1.88	6.33
Other	3	2	0.65	0.12	3.52
Stroke (except subarachnoid bleeding)	15	5	1.42	0.52	3.90
Intracerebral hemorrhage	9	2	2.32	0.50	10.80
Infarction	3	2	0.71	0.13	4.00
Other or unspecified	3	1			
Subarachnoid bleeding	4	0			
Other	2	2			
Aortic aneurysm	1	2			
Aortic thrombosis	0	0			
Other large artery damage	1	0			
Other or multiple cardiovascular disease	0	2			
NONCARDIOVASCULAR CONDITION	273	92	1.50	1.18	1.91
Neoplasm	135	64	1.10	0.81	1.49
Malignant	135	64	1.10	0.81	1.49
Benign	0	0			
Complication after bariatric surgery	7	0			
Complication after other surgery	10	0			
Infection	33	5	3.28	1.24	8.64
Neurological disease	14	5	0.88	0.33	2.40
Kidney disease	8	0			
Liver disease	7	1			

Gastrointestinal disease	3	2	0.34	0.06	2.10
Lung disease	9	5	0.85	0.29	2.52
Thromboembolic disease	8	3	1.56	0.42	5.83
Pulmonary embolism	7	3	1.36	0.36	5.24
Vena caval thrombosis	1	0			
OTHER OR MULTIPLE CONDITIONS	14	1			
CAUSES OTHER THAN DISEASE	38	6	3.48	1.46	8.26
Alcohol abuse	16	0			
Trauma / Accident	11	4	1.38	0.43	4.42
Suicide	11	2	3.11	0.69	13.96
UNKNOWN	4	3	0.66	0.15	2.95
TOTAL	457	125	1.83	1.49	2.23

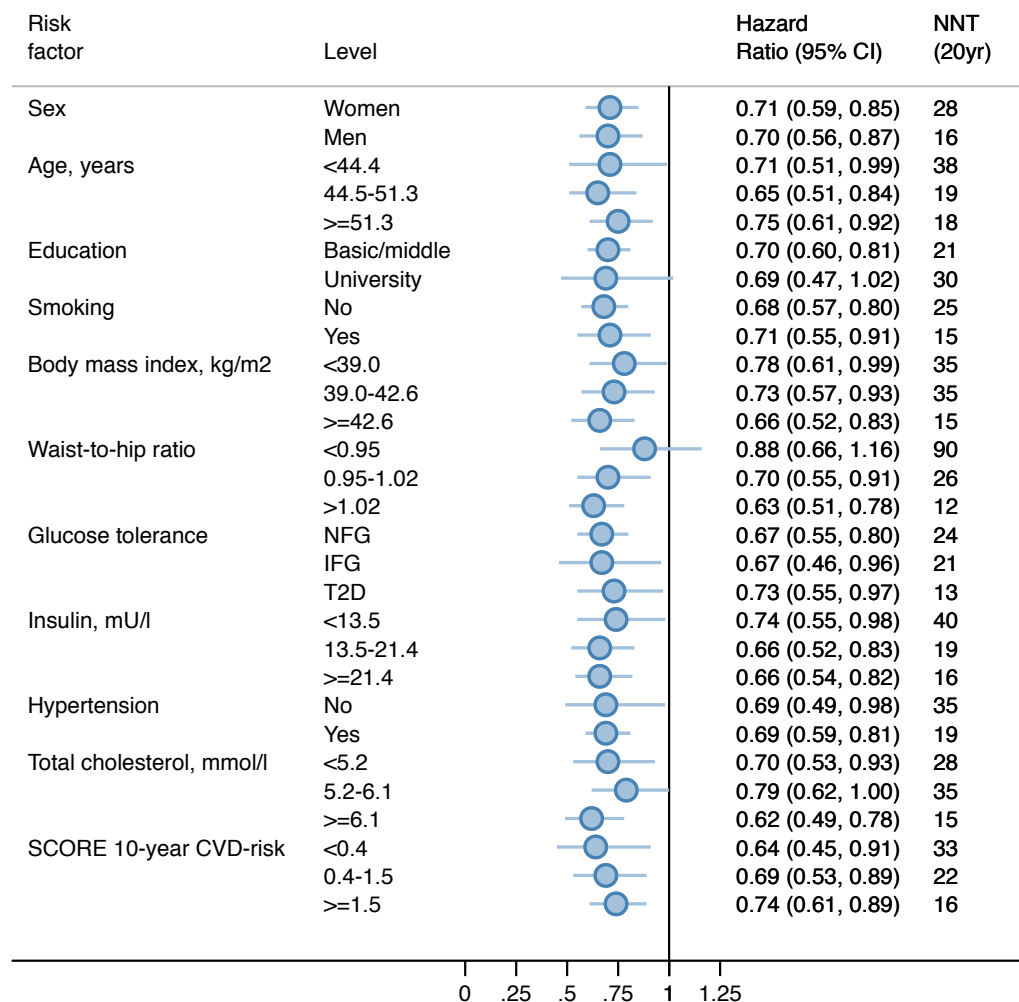


Figure S1. Risk factor treatment interaction of overall mortality in the SOS study.
 NGF, normal fasting glucose; IGF, impaired fasting glucose; T2D, type 2 diabetes; SCORE, 10-year risk of fatal cardiovascular disease; NNT, number needed to treat to prevent one death over 20 years.